LEP Energy WG Report

October 13th, 2001
WWMMI
Cetraro, Italy

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Overview

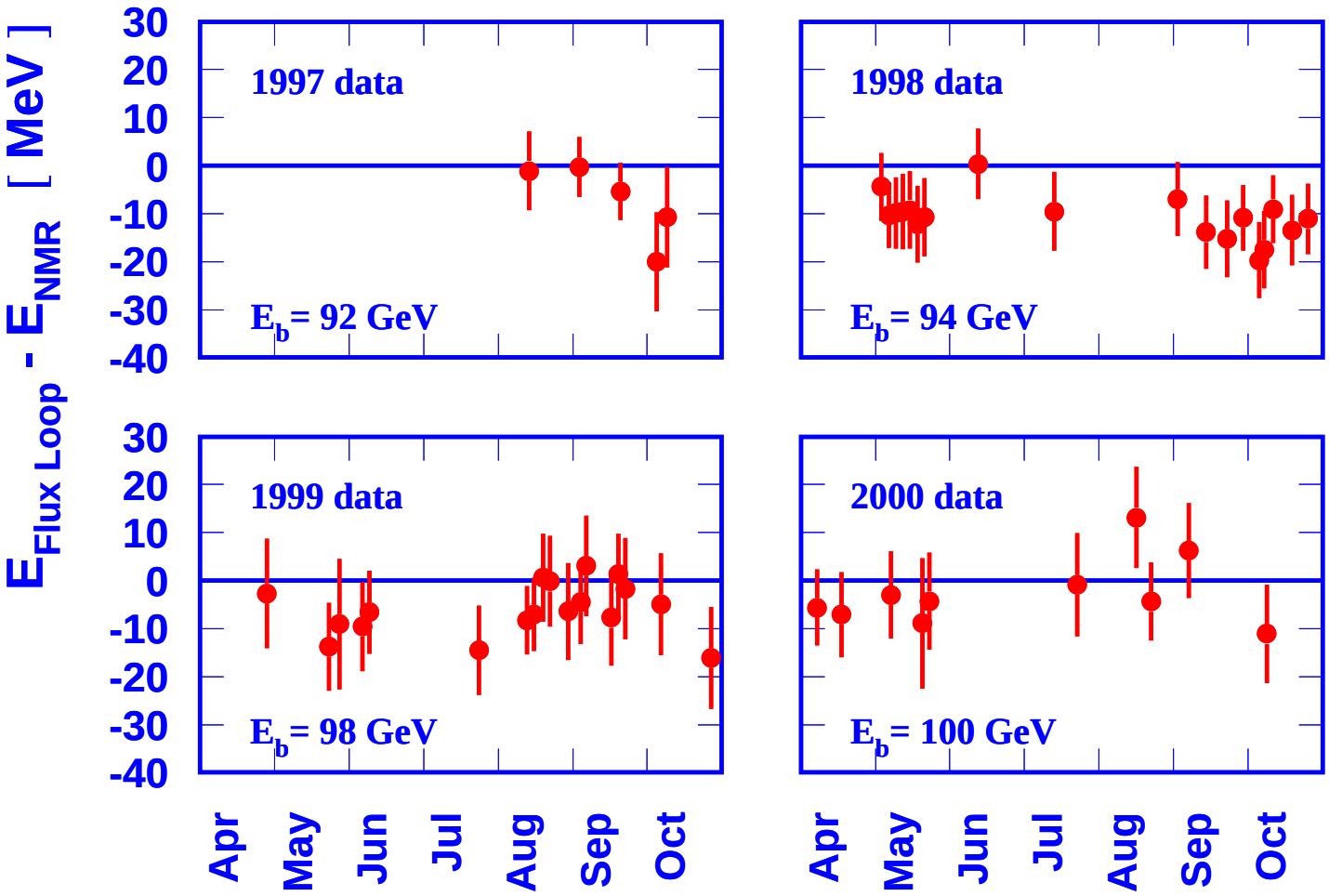
Work Continues in several areas

- Flux Loop analysis
- Q_s vs. f_{RF} analysis
- Spectrometer magnet mapping
- Spectrometer BPM analysis

More general overview available here:

`http://www.cern.ch/LEPECAL/talks/CERN_01Apr`

Flux Loop Studies

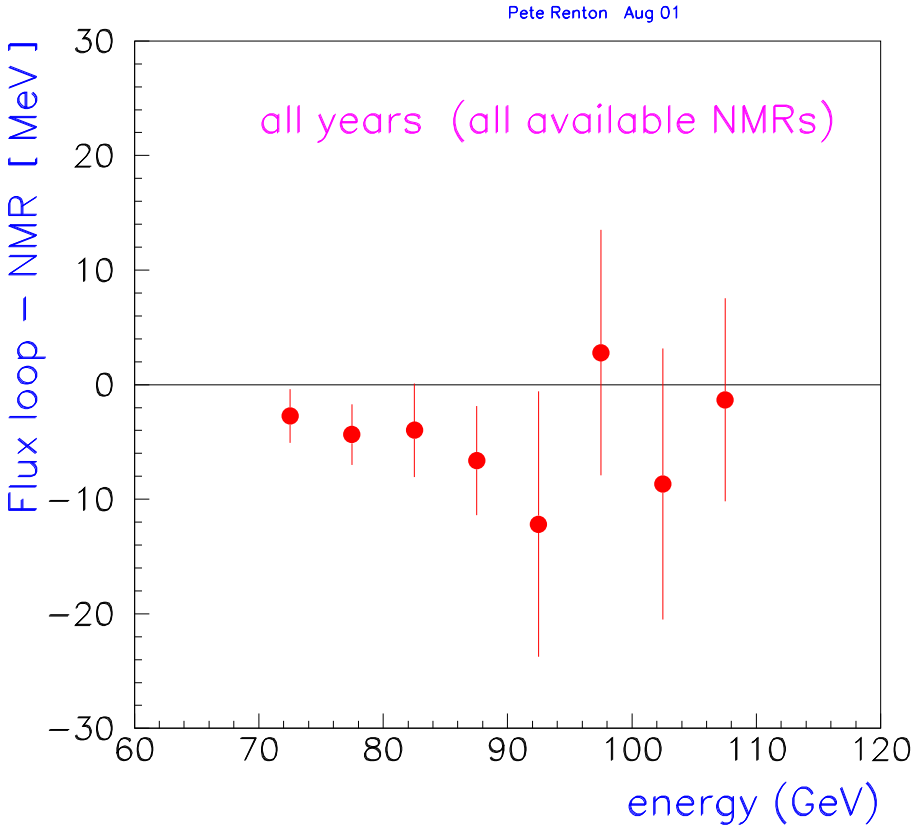


Extensive cross-checks

- Analyze all data combined
- Check against octant, NMR, year, etc.
- Documentation underway

⇛ Stable results for all years

Flux Loop Checks

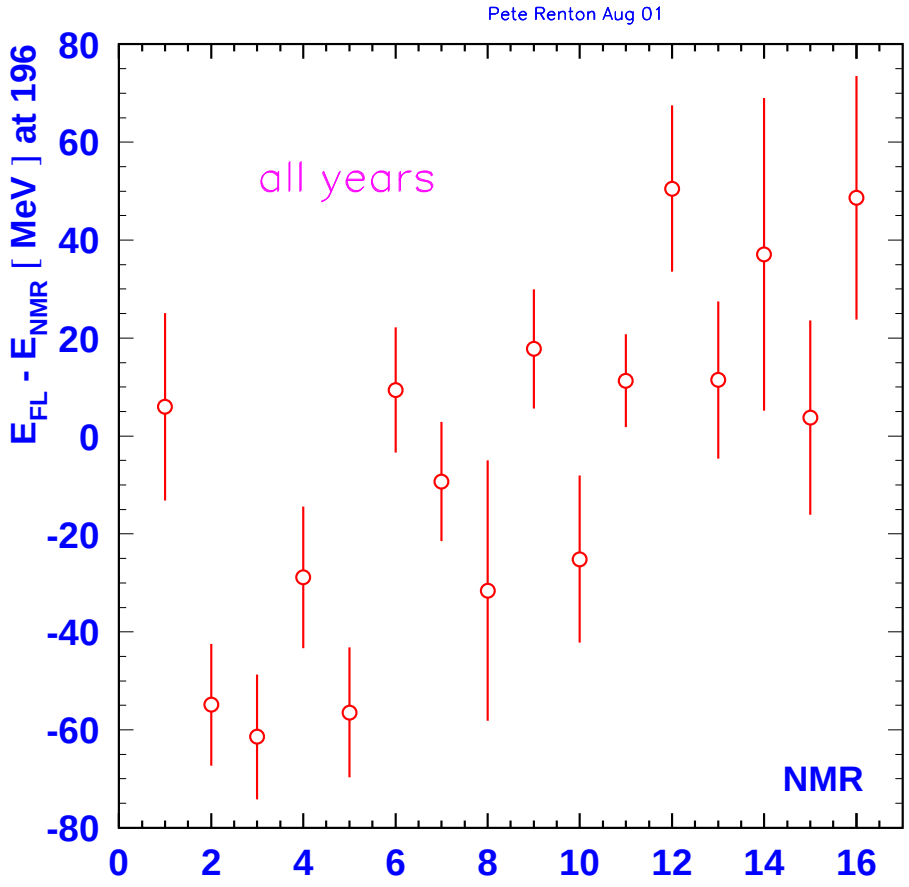


versus

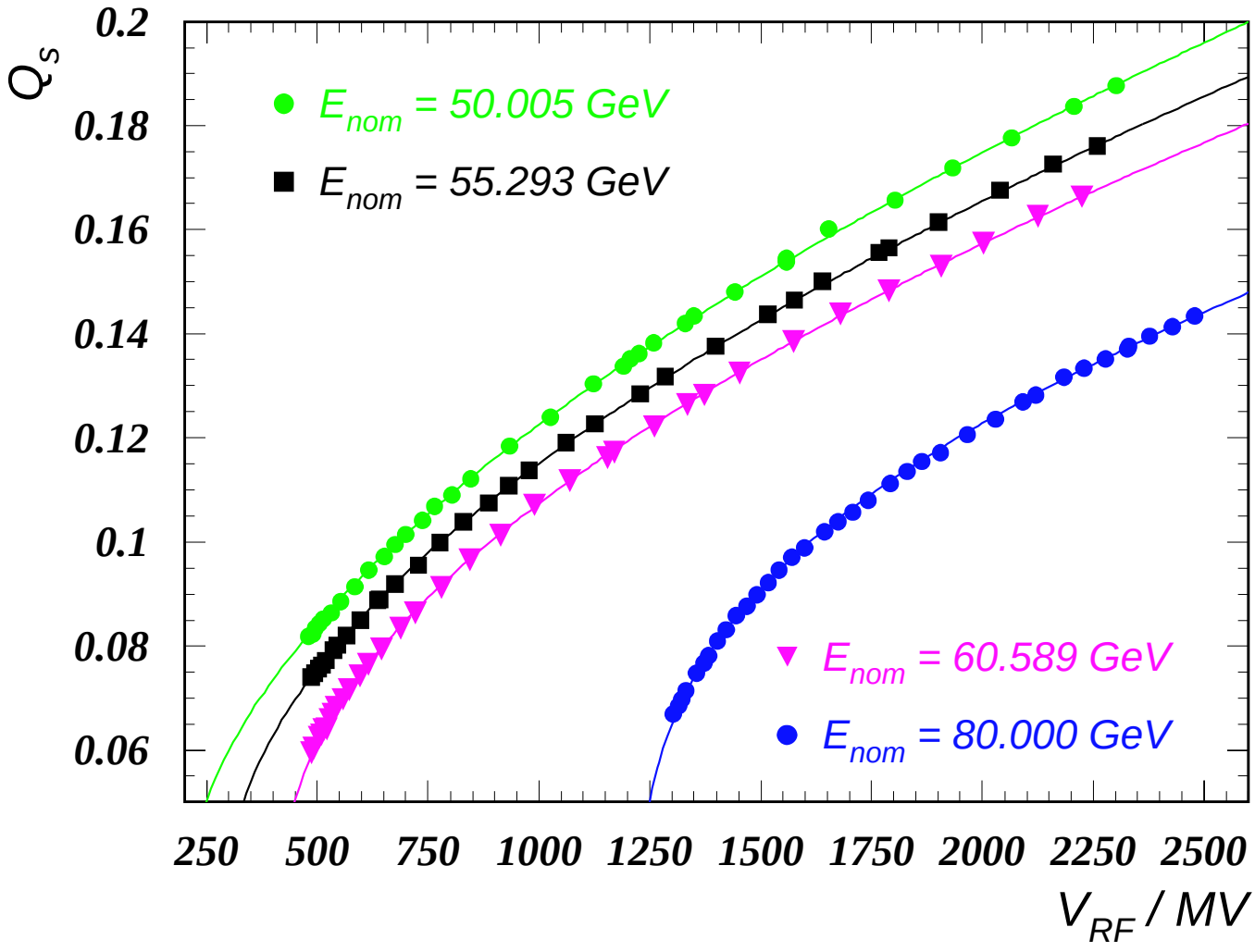
Beam Energy

versus

NMR Probe



Synchrotron Oscillations



$$Q_s^4 = \left(\frac{\alpha_c h}{2\pi}\right)^2 \left\{ \frac{e^2 g^2 V_{RF}^2}{E_c^2} + M g^4 V_{RF}^4 - \frac{1}{E_c^2}\left(\frac{C_\gamma}{\rho}E^4 + K\right)^2 \right\}$$

Momentum Compaction — RF Voltage Calibration — Realistic RF Distribution — Dipole Losses — Other Losses

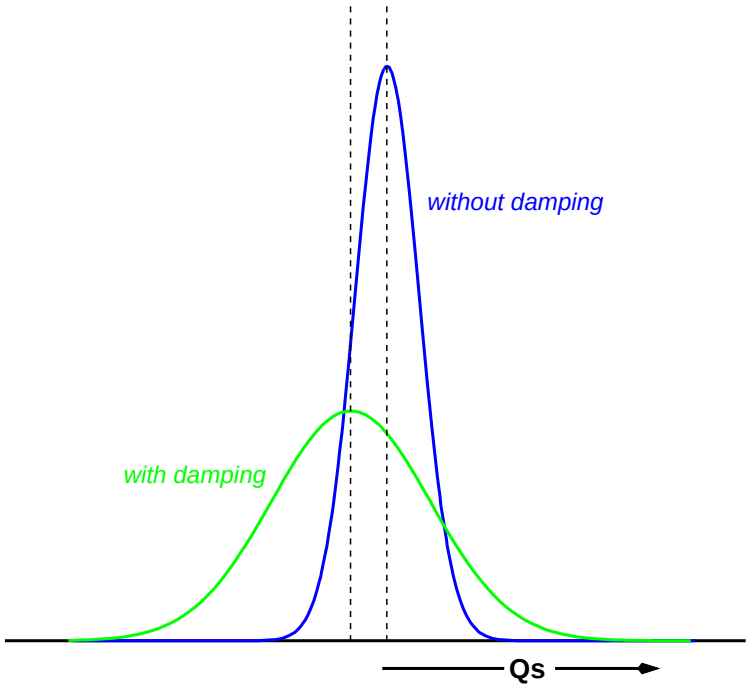
2000 Data

- Three energy measurements
- Additional parameter calibrations
- Energy dependence of g

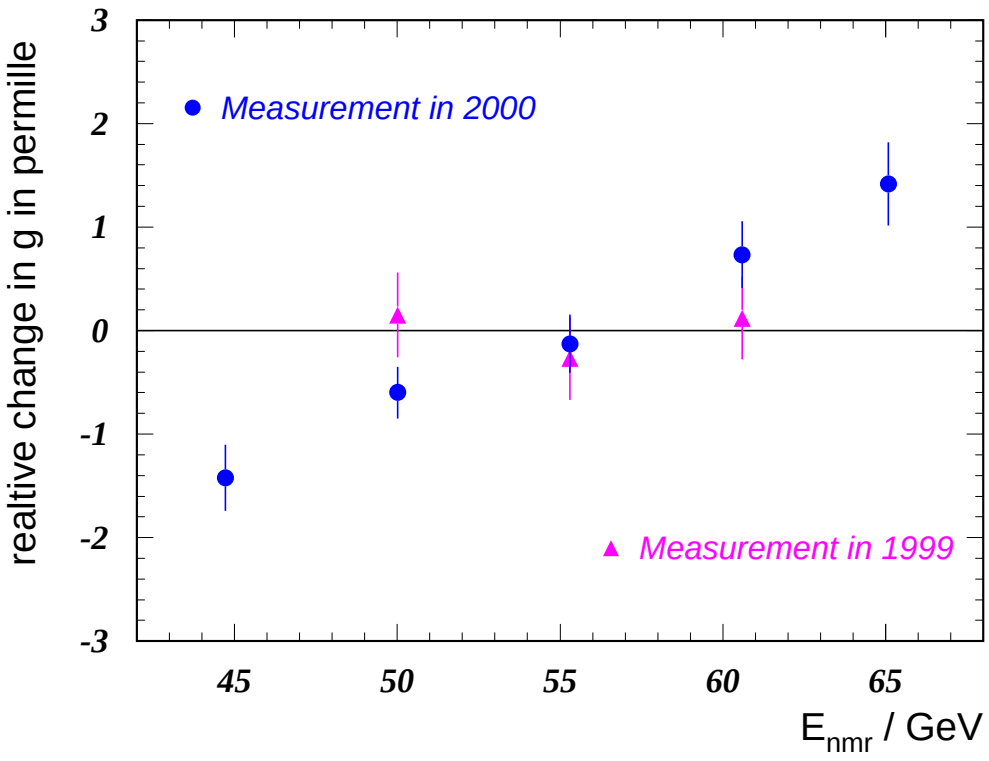
Voltage Calibration

2000 Data

- Enhanced damping
- Need to excite Q_s
- Frequency shifts

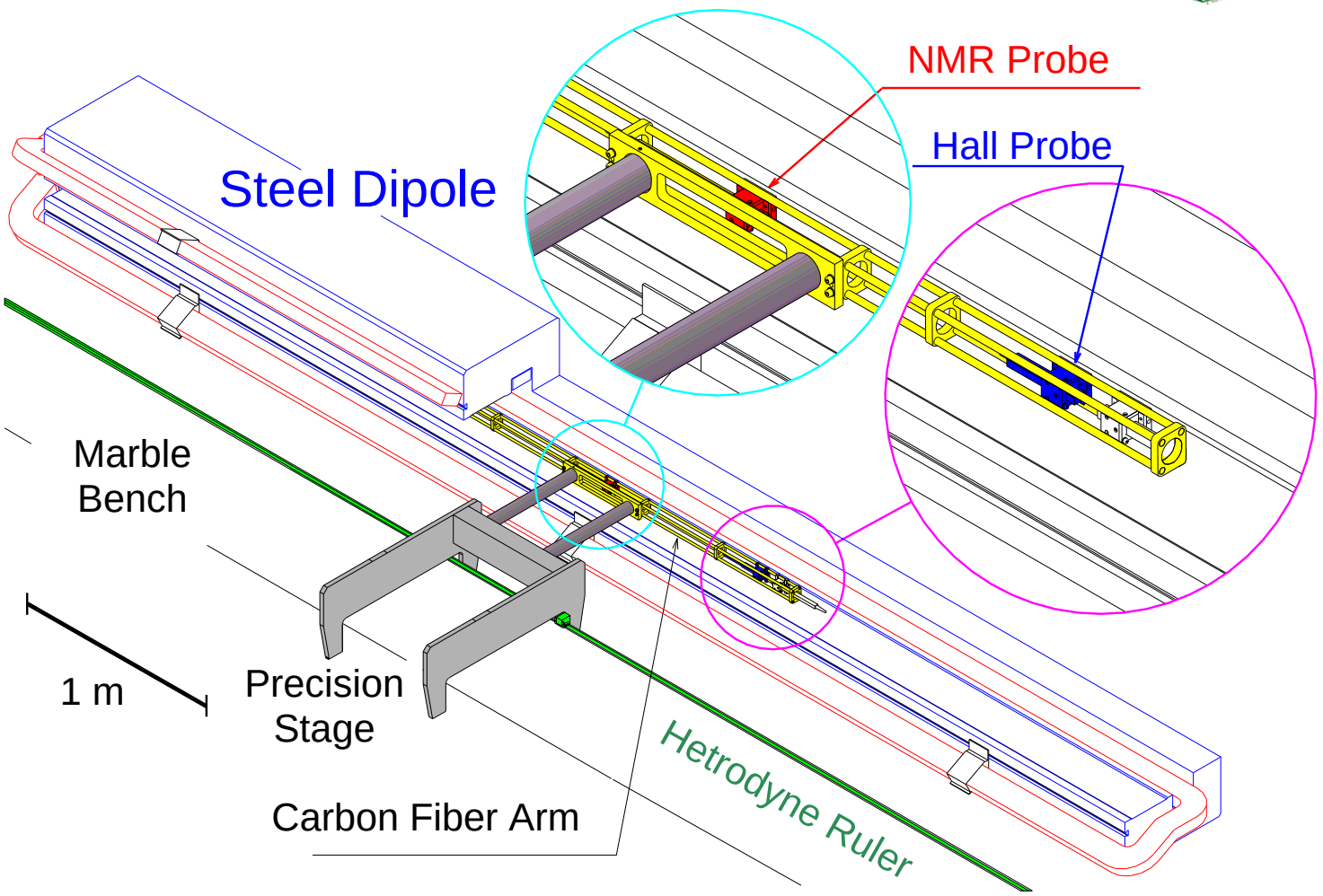


Additional Calibration

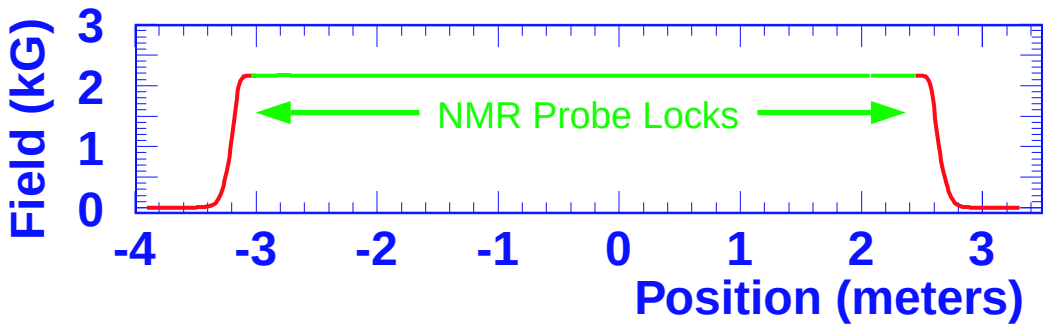


⇛ Does not effect 1999, precision possibly reduced

Spectrometer Mapping

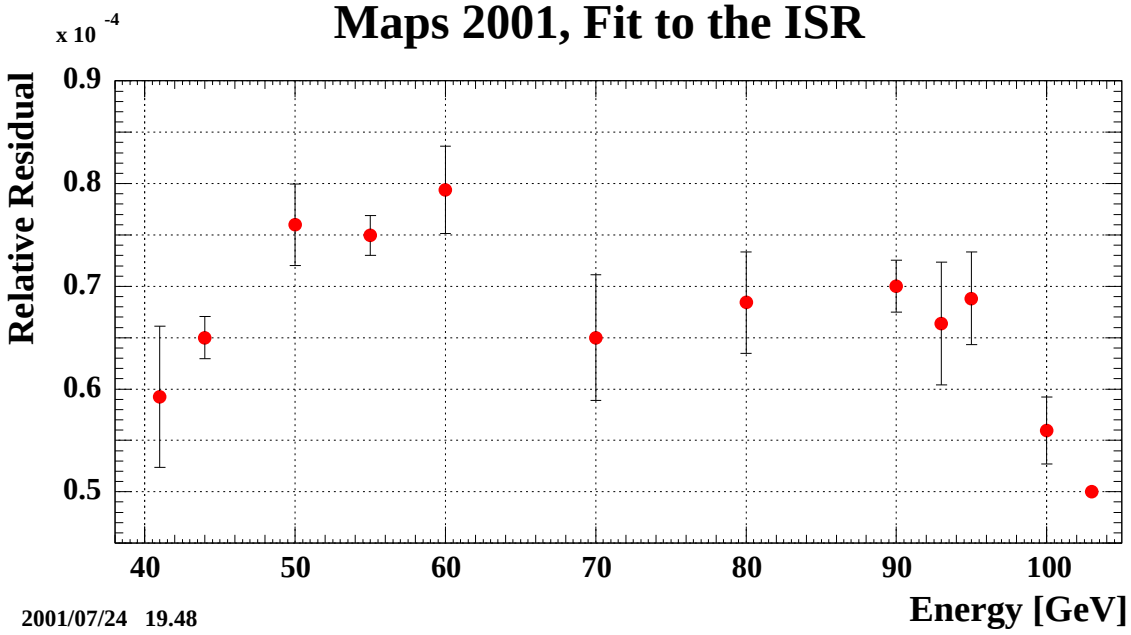


Need $\oint Bdl$ as $f(B_{Ref})$

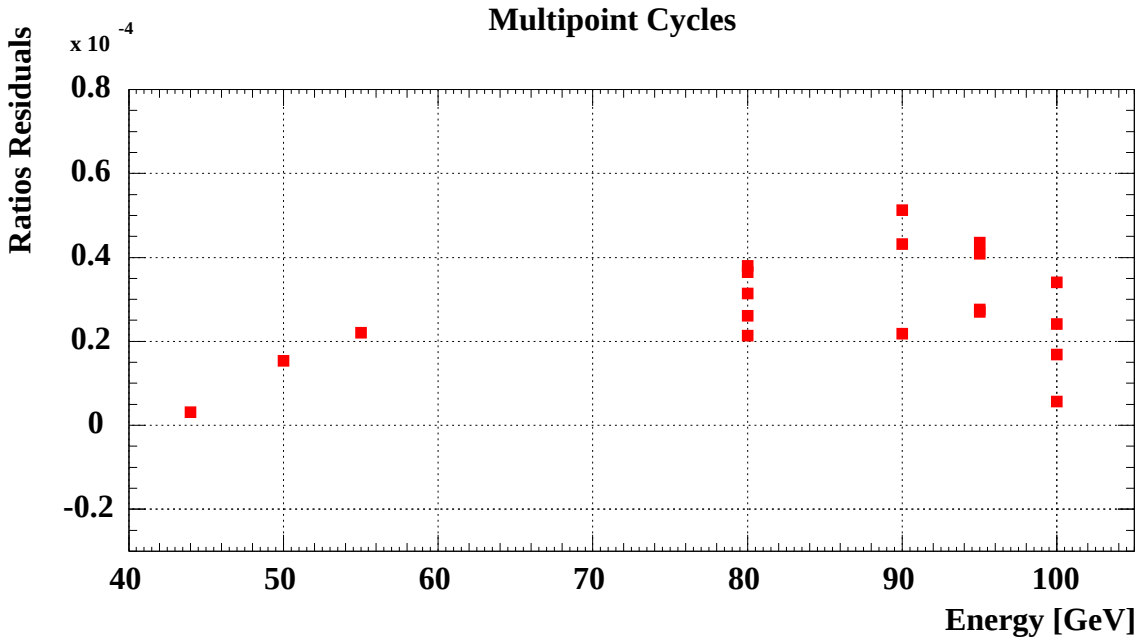


Magnet remapping essentially finished!

2001 Mapping Results

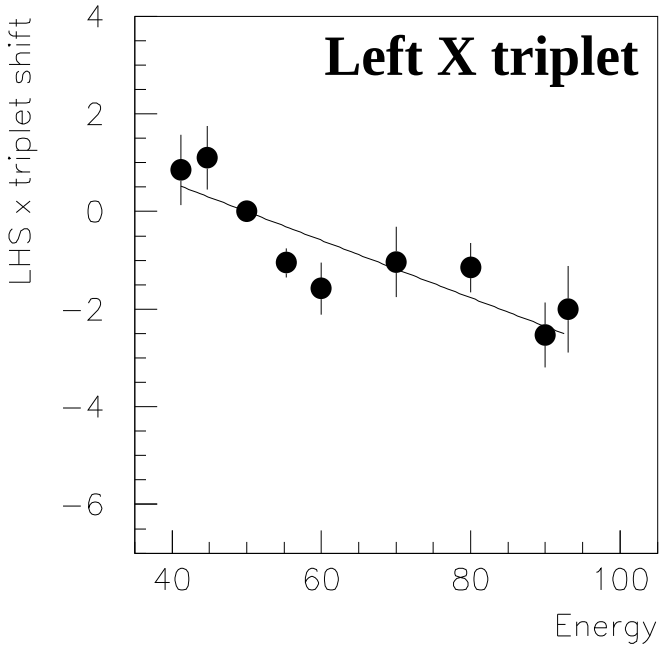


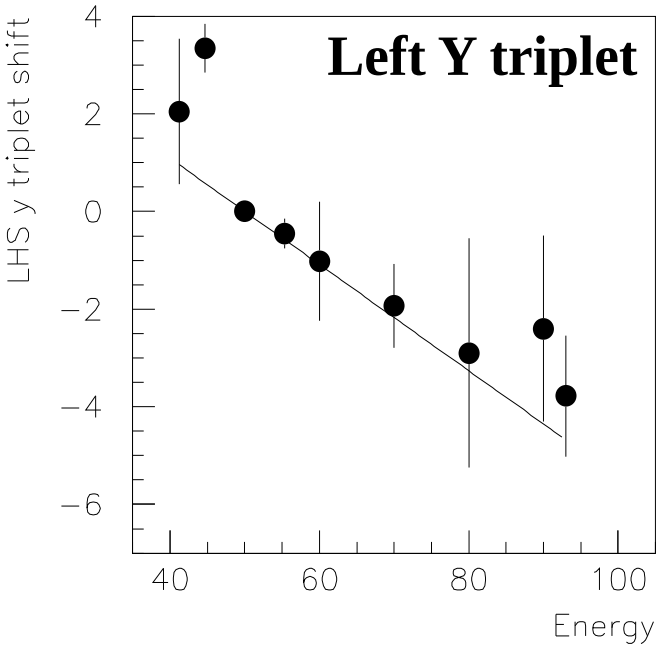
7×10^{-5} offset from 1999!

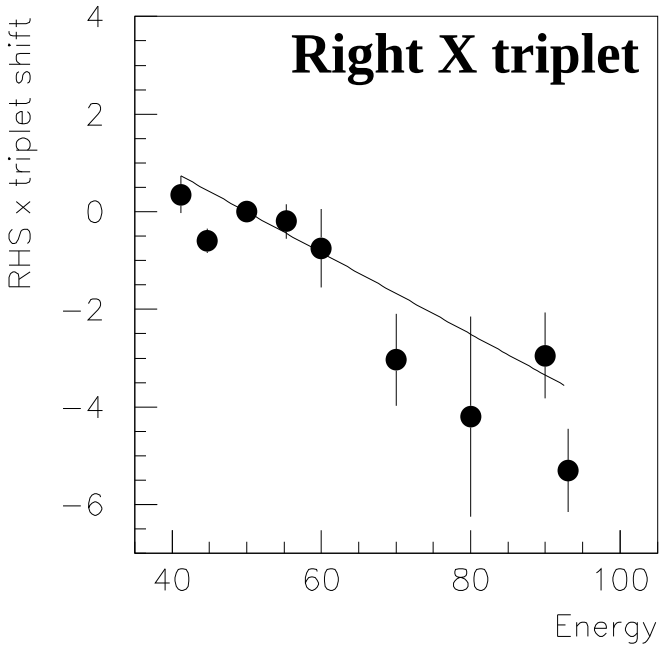


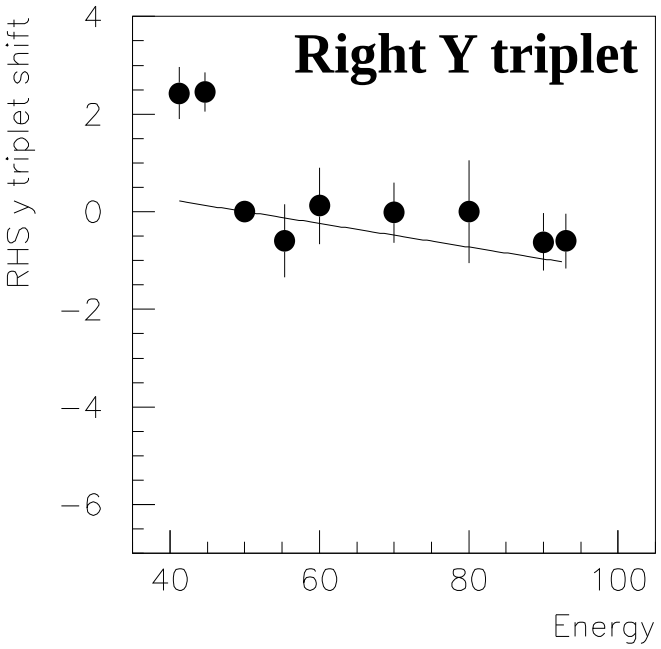
Only 3×10^{-5} in $\oint Bdl_{E2}/\oint Bdl_{E1}$ residual

Spectrometer BPMs









- 1 micron ~ 10 MeV
- Systematic shifts, not random
- Possible to correct?

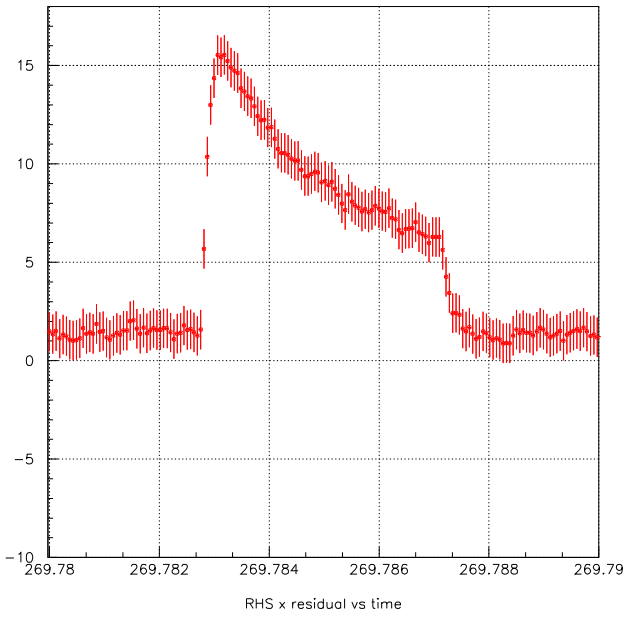
Bunch Length?

Example Wiggler Experiments

Wigglers	σ_z	LHS x	LHS y	RHS x	RHS y
on (7667)	8.4 mm	0	0	0	0
off (7667)	4.7 mm	-4.8	-1.2	+2.3	+0.5
on (7676)	8.4 mm	0	0	0	0
off (7676)	4.7 mm	-4.4	-0.1	+1.0	+2.2

Q_s Experiments

$\sigma_z = 4.4 \rightarrow 3.7 \rightarrow 4.4 \text{mm}$



Bench BPM Test

- Recreate in lab
- Results in spring

Timeline

Flux Loop

- Nearly final
- Documentation started

Q_s vs. f_{RF}

- Additional damping seen in 2000
- Analysis finished by end of year

Spectrometer mapping

- Differences found
- Nothing serious for spectrometer

BPM analysis

- Clear systematic trend
- Correction possible, but explanation?
- Lab test to verify beam measurements

Start writing this Winter

Final document(s) by Summer?